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enable a definite opinion to be formed that the radiant then was very inactive. The sky again became overcast at $17^h$ $46^m$, and remained so until after sunrise.

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## *Observations of the Leonids of* 1899, *made at Durham Observatory.*

(*Communicated by Professor R. A. Sampson.*)

Preparations were made for a count of the expected shower upon a plan adapted from that of Professor E. C. Pickering's Harvard Circular. Maps and directions were given to between thirty and forty correspondents, here and at various places in Yorkshire, Durham, and Northumberland. The sky was divided into six segments, meeting at the radiant and passing through (1) *Regulus*—$\epsilon$ *Hydræ*, (2) $\epsilon$ *Hydræ*—*Pleiades*, (3) *Pleiades*—*Pole*, (4) *Pole*—$\zeta$ *Ursæ Majoris*, (5) $\zeta$ *Ursæ Majoris*—$\beta$ *Leonis*, (6) $\beta$ *Leonis*—*Regulus*. Each observer was to count the number of meteors appearing per minute in his own segment. It was hoped that thus the count might be pushed nearer the maximum, and perhaps some result of interest might appear as to whether the shower began on one side and died away on another. In the actual event the display was so meagre that the directions given were unsuitable, and little interest attaches to the observations except as an item of the average.

At the Observatory watch was kept on November 11, 12, 13, $16^h$ $30^m$—$18^h$; and November 14, 15, $11^h$—$18^h$. On the 12th, 13th, and 14th it was densely clouded. Mr. F. C. H. Carpenter and myself watched on the 11th, and on the 14th and 15th we were joined by six of my students. We saw the following meteors, besides others which were not from the radiant in the Sickle. The paths of some of these were charted.

| No. | Time. | | | Segment of Sky. | Note. |
|---|---|---|---|---|---|
| | | h | m | | |
| 1 | Nov. 11 | 17 | 31 | 5 | b k g. |
| 2 | 15 | 13 | 27 | 6 | |

Between $13^h$ $27^m$ and $15^h$ $40^m$, five or six meteors seen, of which exact record was not taken.

| No. | Time. | | | Segment of Sky. | Note. |
|---|---|---|---|---|---|
| | | h | m | | |
| 3 | Nov. 15 | 16 | 3 | 2 | |
| 4 | | 16 | 14 | 2 | k or. |
| 5 | | 16 | 26 | 6 | k y. |
| 6 | | 16 | 33 | 5 | |
| 7 | | 16 | 35 | 3 | |
| 8 | | 16 | 38 | 4 | k bl. |
| 9 | | 16 | 41 | 6 | k g. |
| 10 | | 16 | 42 | 6 | k bl. |

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| No. | | Time. h | m | Segment of Sky. | Note. |
|---|---|---|---|---|---|
| 11 | Nov. 15 | 16 | 48 | 2 | vb k (5 seconds), curved path. |
| 12 | | 16 | 51 | 4 | k or. |
| 13 | | 17 | 6 | 2 | k bl. |
| 14 | | 17 | 8 | 5 | y. |
| 15 | | 17 | 10 | 3 | y. |
| 16 | | 17 | 24 | 5 | k bl. |
| 17 | | 17 | 25 | 2 | bl. |
| 18 | | 17 | 27 | 2 | |
| 19 | | 17 | 41 | 6 | b k bl. |
| 20 | | 17 | 45 | 6 | k y. |
| 21 | | 17 | 46 | 6 | b or. |
| 22 | | 17 | 49 | 2 | k bl. |
| 23 | | 17 | 50 | 3 | b k g. |
| 24 | | 17 | 52 | 4 | k or. |
| 25 | | 18 | 4 | 3 | or. |
| 26 | | 18 | 8 | 5 | bl. |
| 27 | | 18 | 17 | | |

b = bright, k = streak, g = green, bl = blue, or = orange, y = yellow, v = very.

The numbers that appeared in successive quarters of an hour from $15^{h}\ 45^{m}$ to $18^{h}\ 15^{m}$ were respectively, 0, 2, 1, 5, 2, 3, 3, 2, 4, 2, or at the rate of 1 in $6\frac{1}{4}$ minutes. If for the sake of illustration we analyse these according to the segments in which they were seen, we get

| Segment. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Totals. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 0 |
| 2 | ... | ... | ... | 1 | 1 | 2 | ... | 1 | ... | 5 |
| 3 | 2 | ... | 1 | ... | 1 | ... | ... | 1 | 1 | 6 |
| 4 | ... | ... | 1 | 1 | ... | ... | ... | 1 | ... | 3 |
| 5 | ... | ... | 1 | ... | 1 | 1 | ... | ... | 1 | 4 |
| 6 | ... | 1 | 2 | ... | ... | ... | 2 | 1 | ... | 6 |
| Totals | 2 | 1 | 5 | 2 | 3 | 3 | 2 | 4 | 2 | 24 |

It seems odd that none was seen in the first segment; apart from this the directions seem indiscriminate. But the numbers are altogether too small to carry any weight.

*Durham:* 1899 *November* 27.

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# *Results of Observations of the Leonid Meteors of* 1899 *as seen from the Royal Observatory, Edinburgh.* By George Clark, M.A.

(*Communicated by the Astronomer Royal for Scotland.*)

The sky in the neighbourhood of *Leo* was carefully watched during the whole of the night of Tuesday, November 14, and Wednesday, November 15, from 10.30 P.M. till 6.30 A.M. on each occasion. On both nights the sky was perfectly cloudless, but the fact that the gibbous Moon was riding high in the heavens made it difficult to observe the fainter meteors, and proved a serious drawback to photographic work.

The first *Leonid* on Tuesday was seen at $11^h\ 45^m$, and from then on till $16^h$ they occurred at long intervals, sometimes even half an hour elapsing without a single meteor being observed. As each appeared its apparent path was marked as accurately as possible on previously prepared maps. After $16^h$ it became evident that the shower was increasing, and the meteors gradually occurred more frequently till $17^h$, when for a short time they appeared at average intervals of perhaps one minute.

Throughout the whole night the great majority of the paths radiated from the vicinity of the Sickle towards the southern half of a circle described round the radiant, very few meteors being observed to travel in a northerly direction. There was no difficulty whatever in discriminating between the *Leonids* and other meteors of a more sporadic nature which from time to time flashed across the sky. The radiant character of the former was very evident, and is distinctly brought out by the paths as drawn on the maps. Moreover, the *Leonids* shot forth with great swiftness, and were of an intense bluish-white colour, bearing indeed a marked resemblance to certain kinds of rockets. They had the same sort of bright bulb at the head, and left similar trails, some of which, even in the bright moonlight, persisted for several seconds. Some of these trails were very long, indicating that the meteors had passed "broad on" to the observer; while others were much foreshortened, owing to perspective. It was noticeable that these very short paths were almost all entirely within the bounds of the Sickle. The meteors seen between $17^h$ and $17^h\ 30^m$ seemed to be the most brilliant of the display; but as the Moon set at $17^h\ 19^m$ this was doubtless largely due to the consequent greater darkness of the sky. It did not occur to any of us that what we saw at this time could possibly represent the main stream of meteors, and hopes were confidently entertained that the grandest part of the display was still to come.

On Wednesday night, however, there was a considerable amount of haze; and at $14^h$ a damp, heavy fog came on, which lasted for about an hour. Owing to these circumstances it is more than likely that faint meteors entirely escaped observation;